The use of common towels on common carriers engaged in interstate traffic is prohibited by the following amendment to the interstate quarantine regulations promulgated December 9, 1912:

AMENDMENT TO INTERSTATE QUARANTINE REGULATIONS.

TREASURY DEPARTMENT,
OFFICE OF THE SECRETARY,
Washington, December 9, 1912.

To medical officers of the Public Health Service, State and local health authorities, and others concerned:

ARTICLE 3, general regulations, is hereby amended by the addition of the following paragraph:

PARAGRAPH 14. Common carriers shall not provide in cars, vehicles, vessels, or conveyances operated in the interstate traffic, or in depots, waiting rooms, or other places used by passengers traveling from one State or Territory or the District of Columbia to another State or Territory or the District of Columbia, any towel for use by more than one person: *Provided*, That towels may be used again after having been sterilized with boiling water.

FRANKLIN MACVEAGH, *Secretary.*

Since 1911 fourteen States have enacted legislation restricting or prohibiting the use of common towels in public places. These States are Arkansas, Connecticut, Iowa, Maine, Massachusetts, Missouri, Montana, Nevada, North Dakota, Ohio, Pennsylvania, South Dakota, Vermont, and Wisconsin. Certain other States have promulgated regulations restricting the use of roller and other types of common towels in public or semipublic places.

SCREENING AS AN ANTIMALARIAL MEASURE.

By H. R. CARTER, Senior Surgeon, United States Public Health Service.

There are three methods of malarial prophylaxis in general use:

(*a*) Getting rid of the insect hosts—the Anopheles mosquitoes.

(*b*) Preventing access of these mosquitoes to men.

(*c*) Rendering men more or less insusceptible to malaria when infected mosquitoes have access to them.

The last two methods prevent the infection of mosquitoes to some degree, which is also a prophylactic measure.

The first method attacks the problem from the insect end of the chain; the other two from the human end. The first is unquestionably the method of preference where practicable. Unfortunately, it is not always practicable. The others can give, however, a high degree of protection and are, one or both, nearly always available. The relation between the first and the other two may be compared with that between the purification of a water supply by a municipal plant and the filtration or boiling of such a water by each householder or individual for himself. The first is the method of election, yet the

other furnishes pure water and may be the only thing possible, as where there is no municipal control or no municipality.

The object of this paper is to give some points on the second method (*b*), viz, the use of screens in houses and mosquito bars for beds.

Advantage of Screening.

The advantages of screening are obvious. The malaria-bearing mosquitoes in the United States feed, so far as known, only at twilight and during the night.[1] Being shy, they are also far less apt to bite a man who is moving than one who is quiet. Thus the greatest danger from them is to people asleep at night. If, then, they can be excluded from the house—and good screening properly used will do this—and the family remain in the house after dusk, its members are protected from these mosquitoes, and hence from malarial fevers. Many instances could be given of the good results of this protection, but it seems too obvious to require illustration or to be disputed. We will assume, then, that the advantages of screening as a preventive measure against malaria are granted, and this paper is simply to give the methods of screening judged to be the best. That such a paper is advisable—nay, necessary—is evidenced by the fact that the writer has seen no single house perfectly screened against Anopheles mosquitoes since he left the Canal Zone, and he has seen and examined many.

There are certain disadvantages connected with screening, some of which are inherent and some due to faulty methods of application. Screens (1) keep out the air; (2) prevent the use of the window openings to throw things out; (3) make going through the doors more troublesome; (4) are troublesome to keep closed; and finally (5) are an item of cost.

Screening properly planned should avoid these disadvantages as much as is compatible with efficient protection against mosquitoes and proper planning will minimize them.

Openings to be Screened.

The openings to be screened are of three kinds: Verandas, doors, and windows, and screening is differently applied for the three.

For verandas the screening is stationary: For doors the screens swing on hinges like doors: For windows they are stationary, swinging on hinges, or sliding up and down, as the case may be.

Unless deterred by cost every house furnished with a veranda should have that veranda screened, or a part of it at any rate. Of course, the veranda need be screened only if it is used for a sitting room in the

[1] On the Canal Zone some species feed, exceptionally, during the day and they may, and probably do, so feed in the far south of the United States.

evening. But this is an almost universal practice in malarial districts during much of the malarial season. Even then this screening is of less importance than that of the house itself because one spends many more hours of the night—the feeding time of Anopheles—in the house than on the veranda, and because for each hour a sleeper, being still, is more apt to be bitten than one who is awake and thus more or less moving.

The screening of a veranda is costly because it takes a considerable quantity of netting. Since this netting is fastened on permanently it is exposed to weather the year round, instead of being housed during the winter, as is the case with detachable screens, and hence does not last as long. There is, however, no expense for frames and hardware as for window and door screens, and such doors and windows as open on the veranda need not be screened. On the Isthmus, where labor was high and where all screens must remain in place 12 months in the year, it was considered almost as cheap to screen the verandas as to screen the doors and windows opening on them. In the United States this would not be true and the expense of screening verandas will frequently be deterrent. Yet where it can be done the added comfort and safety—for the veranda will be used as a sitting room at night—will more than repay the expense. Of all screening it is the safest, as it has only one opening—the door.

It is not worth while to discuss the advisability of screening the doors and windows. All windows and all doors opening out of doors must be screened, except, of course, those opening into a screened veranda. Screen doors are far more likely to admit mosquitoes than window screens, as the former must be opened frequently while the latter should be opened rarely or not at all. Screen doors also are rather costly. On the Canal Zone, therefore, only two outer doors were allowed to a house.

The things to be considered are:

(1) The netting common to all screens.

(2) Frames necessary for doors and advisable for windows.

Springs and fastenings are needed only for doors and such window screens as swing on hinges and will be considered with them.

The netting is attached to the frame by cutting it large enough to fit in a groove which goes around the frame on the inside edge, bending at right angles and coming up flush with the surface. It is secured by a square beading pressed down in this groove, the brads securing it going in at right angles to the plane of the frame. It is thus securely held, the bend of the wire being a prime factor in securing it.

In screening verandas movable frames are not needed and the broad areas of lap on the boards given to the wire covered by a batten—say 2 inches wide—render a groove unnecessary. Where

netting is simply tacked across window openings no groove is possible or needed, but a narrow battan is necessary else the wire will pull out. Wire secured directly by nails will not hold.

Materials Used in Screening.

Netting. Wire netting is made of various materials. In Baltimore four different kinds are offered. All of it is obtainable in widths of from 2 feet to 4 feet, the differential between widths being 2 inches. The prices given are by the roll—100 linear feet—and vary, depending on quality and sizes of mesh. Eighteen mesh, for instance, is higher than 12 mesh of the same material and width. The prices given as follows are for 16 mesh:

(1) Japanned iron—i. e., painted while clean and hot—$1.50 per 100 square feet.

(2) Galvanized screening at $3 per 100 square feet, $2.50 for No. 14.

(3) Sherized iron; also called "Galvanoid," sometimes "Rustless." It has a dull finish, not bright like galvanized. Dealers state it is more lasting, $3.15 per 100 square feet, $2.65 for No. 14.

(4) Bronze; also called "composition." Costs $5.50 per 100 square feet.

(5) Copper. Same cost as bronze.

In addition, I have seen very fine netting of brass wire (on the revenue cutters in the Gulf) which would almost keep out sand flies. They were reported to be expensive but very lasting.

Remembering that three-quarters of the expense of screening windows, and more than that for screening doors, is for the frame and setting, and that the length of time the screen lasts depends on the quality of the wire, it would seem false ecomony to use the cheapest netting. For ordinary use I would advise the sherized or the galvanized nettings, although they will not last as long as either the copper or bronze. The japanned iron, however, has lasted in Baltimore since 1902—10½ years, but it was on the outside of windows and under galleries little exposed to the weather, and taken down and stowed in the winter. It was painted once every two years from the third year.

The bronze netting is excellent, stiff enough, and resisting to weather. It is said to last 50 per cent longer than the above, but I have no exact figures.

The copper ought to resist the weather almost indefinitely, but would be ill suited for doors or sliding screens for windows, as it is soft and stretches easily, and a moderate push would open its meshes.

It is to be noted that the farther south we go the shorter the life of a screen, because it remains longer in use each year. Screens should be taken down and stored in the winter. Also the life of a screen is very short on the sea coast on account of the salt in the air. For instance, at the Chandeleur Islands, plain iron screening—

No. 14 painted—did not last the season through. It was replaced by ordinary mosquito bar—bobinet doubled—which lasted the whole of the next season. This, of course, may also be used ashore and will last one season. It is not necessary to double it unless, as was the case above, the bar was unusually coarse.

Naturally, when the netting of a screen is worn out other netting can be stretched over the frame, so it is to some extent misleading to limit the life of a screen by that of its netting. A good frame will last 20 years. Those at the Baltimore Marine Hospital were put on in 1902, by the writer, and are still good, as good as they ever were. They are ¾ inch thick for windows and 1 inch for doors.

Size of Mesh.

The size of the mesh of a screen is indicated by its number—thus, No. 16 has 16 meshes to one linear inch—each being, then, less than one-sixteenth of an inch wide by the thickness of the wire. One wishes to use the largest mesh compatible with exclusion of mosquitoes so as to keep out the least air possible. Also the wire being larger with the larger mesh it is less fragile and lasts longer, hence is cheaper. No. 16 will exclude Anopheles. No. 18 was adopted on the Isthmus because we wished to exclude *Stegomyia* (*Aedes*) *calopus* also, which No. 16 will not do. Where this species exists, as in our seaport towns, No. 18 is necessary for comfort, but No. 16 is sufficient for protection against malarial fever. No. 14 is passable by some Anopheles, but if already in place—where economy is important—a coat of thin paint will bring the mesh down to about No. 16 size and also lengthen the life of the screen. It must be thin so as not to close the meshes.

Whether No. 12—the most common size I found in use in North Carolina—can be made safe by two coats of paint I do not know. It would be worth trying and I think it would be reasonably safe, but would then exclude more air than No. 16. Two coats of paint on heavy wire should last a long time. The experiment as to whether No. 12 mesh with two light coats of paint would exclude Anopheles could easily be tried.

There is considerable economy in the use of No. 14 netting, painted, in place of No. 16. It is difficult to paint the latter without stopping up the meshes, while No. 14 can be painted. Paint is a perfect preservative against the weather as long as it lasts. There is screening in use in Baltimore—No. 14—which has been painted four times at biyearly intervals. It can not be painted again as the mesh is getting stopped up. The ordinary japanned iron screen, No. 14, thus treated is very economical.

Frames.

As before said, frames are not used in screening verandas. Netting may also be applied to windows without frames—simply tacked down by battens. This is not, however, the best method—as will be seen later—and for windows, frames had best be used. Frames should be heavy enough not to warp—$\frac{3}{4}$ inch to 1 inch for windows and 1 inch to $1\frac{1}{4}$ inches for doors, or even $1\frac{1}{2}$ inches if very large—these measures being of the frame after it is dressed. Those that are immovably secured in place need not be very heavy as they can not warp; yet a light frame is much more apt to be injured in handling—taking out and putting in—than a heavy one. In the long run heavy frames are cheapest. Obviously window screens that swing on hinges—as is sometimes necessary—are doors and must be heavier than those which slide in a fixed groove or, with a groove in themselves, slide over a fixed guide. Both of these arrangements keep them from warping.

Frames must fit tight, for mosquitoes try every point patiently and with infinite perseverance looking for entrance. Where they can not fit absolutely tight let them have broad surfaces of contact, as by the flat surfaces of two boards, as Anopheles mosquitoes do not enter by such openings.

For screens that swing on hinges then—doors and some windows—we can not depend on the edge fitting. It will either be too tight and not close in wet weather, or leave an opening in dry. These screen doors must shut against a broad surface—a batten—on the top, bottom, and side, so that no matter whether the door shrinks or not it will shut flat and tight, provided, of course, it does not warp.

Similarly, double screen doors swinging both ways are not allowable. A gap to admit mosquitoes where the edges of the doors join is inevitable. Where a double door is needed one half should be fastened and a broad flange attached to its edge for the other to close against. Possibly metal doors with rubber strips setting out from their edges would be safe. I have never seen them tried. The battens I have recommended, and used, perfectly allow for shrinkage, but would not make up for much warping. Still, I have not found that mosquitoes came in through cracks between broad surfaces or around angles. They seem to fly into holes and struggle through, not to crawl into and through them. Indeed, the writer has had little or no trouble from screen doors warping, but much from not fitting at the edges. Von Ezdorf recommends a very simple method, by the use of canvas strips, for obviating the ill effects of both warping and shrinking. He reports it as entirely satisfactory, as I am sure it must be.

For sliding screens for the lower part of windows the groove or guide on the sides prevents warping and allows for shrinkage, and

there is no difficulty in fitting closely except where the top bar of the screen frame lies flat against the bottom piece of the lower sash when the latter is raised to its fullest extent. There must be some play allowed between the screen and the lower sash, else neither can be moved. Here, however, we have two fairly broad surfaces in apposition and we have not found mosquitoes to enter, even when the opening was, say, $\frac{1}{10}$ or $\frac{1}{8}$ inch wide. Von Ezdorf's canvas would doubtless be satisfactory here even were there a larger interval.

Windows.

Just one word here on the subject of screens for windows. These must vary with circumstances: As the arrangement of the window sashes; The presence of outside shutters; Whether one must open the screen; And the expense.

(1) In all cases it is preferable, and very much preferable, to have the screens immovable, and thus, of course, outside, so that not even carelessness can leave them open. If they can be opened they will at times be left open and at night. The screens should be in frames and these secured in the openings with screws, so that they can be taken down and stowed in the winter. If the upper sash lowers, these screens must extend the whole length of the window. If the upper sash is immovable a half length screen to cover the opening of the lower screen is sufficient. Neither of these allow of the use of outside shutters. If it be necessary to use outside shutters, these screen frames may be made in two parts, one above the other, united by hinges. The lower frame need not be over 12 inches or at most 18 inches high, and should fasten shut by hooks or catches. One will rarely forget to close it tight; and yet that it can be opened is a source of danger, and if one can do without outside shutters it is safest to do so.

(2) Where outside shutters must be retained and the top sash is immovable the outside screen may be retained another way by sliding up just outside the upper sash. This is better than a screen inside the window because it will protect the openings at all degrees of lifting the lower sash, which the inside screen would not do.

(3) When shutters must be used and both window sashes are movable a screen covering the whole opening may be swung on hinges like a door on the inside of the window. Its frame will have to be made extra heavy to prevent warping or have an extra fastening to press and keep it accurately into position when closed. For windows of ordinary width only one leaf of screen should be used hinged on one side and fastening on the other. This screen has the advantage of all inside screens of being protected from the weather and will last longer than outside screens. It is not fitted with springs.

(4) The half screen inside the window to cover the opening of the lower sash and running up and down on guides or in grooves is familiar to everyone, as is the fact that unless pains are taken to raise the lower sash to its full height large spaces are left between this sash and the screen, and between the two sashes as well, through which mosquitoes, flies—even small birds—can come. These screens are safe only when the lower window is raised to its full extent, or close shut—when they are useless. If sufficient pains are taken they are safe—but they are not screens for careless persons.

(5) The ready-to-use adjustable screens, that are put under the lower sash and held in place by its weight are—all that I have seen—valueless. Indeed, they are a disadvantage, turning the house into an Anopheles trap. They do keep out some flies.

(6) A window can be screened without using a frame by covering (a) the whole opening, or, when the upper sash is fast (b), the lower part of it with netting directly applied to the window frame and held in place by battens—say three-fourths inch strips. This is entirely effective and, in first cost, much the most economical—as one saves the cost of the frame. Eventually it is not economical, as the wire will have to be left out in the weather the whole year. The shorter the winter—as in the far south—the less important this factor becomes. This arrangement is also decidedly inconvenient to those living in the house—washing windows, etc.

Doors.

I have spoken of how doors should be fitted so as to shut against battens and the canvas strips recommended by von Ezdorf. In addition doors should:

(1) Open outward—always and invariably—else the mosquitoes which we can see settled on them will be introduced into the house when they are opened.

(2) Not only should there be a broad board for a brace about the level of one's hand in opening the door, but above this board, and below it, there should be on the inside of the door strips of wood—say 1 to 2 inches wide—to protect the wire screening from the push of the hands, knees, or feet of one trying to open it from the inside. Heavy wire screening thus disposed is much better. One does not push from the outside of the door. Both of these devices strengthen the door.

(3) The free edges of doors—i. e., edges opposite the hinges—which are approached by steps from the outside should be about the middle of the steps and, to enter the door, one must open it much wider and hence keep it open longer if he comes up opposite the middle of the door, than opposite the free edge of it. This is not of prime importance, but—especially where Anopheles are numerous—of decided advantage.

(4) Doors should be fitted with springs which close them certainly and quickly—even if they do bang. The liquid check springs and the pneumatic check springs are utterly unsuitable as, at the last, the door just crawls shut. Springs on the hinges, if kept tight, are fairly satisfactory, as is the long spiral spring which the door extends as it opens, only on account of the narrowness of the space between the screen door and the true door, it works at an angle which takes much from its effectiveness. A door fitted with this spring must be fitted with a "stop" of some kind—line or cleat—else if the wind catches it partly open it may blow it entirely around—180° from its position when shut—when the spring will have no power to close it.

In my experience—and I have seen many—the most satisfactory spring is one that is fastened to the jamb, on the same side as the hinges, on the outside, and has an arm—14 to 18 inches long—extending along the middle batten of the door. Along this batten is a narrow steel plate, on which runs a small wheel fixed in the arm. The arm is the extension of a spring coil of some power and is by it pressed against the door—this pressure, of course, increasing as the door is opened.

(5) Doors must have proper automatic fastenings, so that when shut they are secure against wind. Stops to prevent their opening too wide are an advantage on all doors. They save the springs. They are a necessity if the long spiral spring is used. Where the screen door shows a tendency to warp, two fastenings some distance apart may be advisable, so as to press it firmly against its battens and hold it flat when shut. To use them gives some extra trouble, but one soon becomes instinctively careful about a screen door and in practice they will be used.

(6) A vestibule with two doors is rarely necessary for Anopheles. It was used on the Isthmus, with a pan of burning pyrethrum in it, for the single entrance of the yellow-fever ward, and I have seen vestibules, with smudges of red mangrove, on the Indian River, amidst swarms of Culex. They are certainly an added safeguard and where Anopheles and money are abundant are advisable.

Other Openings.

No direct opening should be left from the outside into a screened house. This goes without saying, yet what I would inculcate is that we must look for these openings, and look for them very carefully. I have recently seen a large veranda very carefully screened, except that the door opened inward, with six scuppers for draining rain water from the floor cut in the baseboard of the screen frame. I could put my finger through them and the board was only half-inch stuff. Keyholes in all out doors, screen or solid, must be plugged up. It isn't sightly, but a small "wad" of newspaper is efficient for this

and also for temporary closing of small accidental holes in the screens. Von Ezdorf, a very careful observer, lays stress on the danger of entrance by the fireplace, coming down the chimney. Of this I have had no experience. Most of my mosquito work has been done in places where there were no fireplaces in the houses. I do not doubt that Anopheles do come down a chimney, or some chimneys, and, if so, the entrance must be guarded. Von Ezdorf recommends cloth tacked over the fireplace opening held in place by lath battens.[1]

Apparently the chimneys could be efficiently stopped and, if so, most easily by stuffing bags of hay and newspapers tightly into the throat of the fireplace. They would have to be stuffed in so as to fit tightly all around, not just at random. At the quarantine station on Ship Island, Dr. Burkhalter tells me the tops of unused chimneys are covered with sacking tied on. This is absolutely efficient and protects at one operation all the fireplaces connected with that chimney. It must, however, be difficult to put in place and would have to be removed and replaced if a cool spell requiring fires was followed by a warm one. The flight of certain kinds of Anopheles—albimanus and tarsimaculata—on the Canal Zone, as observed by Le Prince, was high in the beginning and "as it gets dark enough to be hard to see" low—"from one to ten feet above the ground." High chimneys may, then, be safer than low ones. I think none entered by my chimneys in Louisville—a 3½-story building—where Culex were very prevalent and Anopheles fairly so.

Now there is one thing about small holes by which mosquitoes may enter a screened house which we must notice. Anopheles is not a house mosquito. She lives out doors and enters a house only to feed. She enters the house at night and when it begins to get light she tries to leave it. She will try to enter all night long—possibly attracted by the scent of people, but I do not know—and will find a hole, no matter how small, if it exist. She has only a short time to get out, however, and unless the way out is fairly clear she can not do so and has to remain in the house, hiding in dark places and corners; under the bed especially. A screened house with a reasonable number of small holes becomes, then, not a protection but a mosquito trap for collecting Anopheles. This I have seen time and again. Frequently very full fed mosquitoes remain in the place of feeding even when there is a clear way out, hiding in dark places.

Mosquito Bars for Beds.

(1) *They should be of fine bobinet.*

(2) *They should not be made with a slit in the side.* Such a thing is an abomination—and it is common.

[1] Public Health Reports, Feb. 27, 1914, p. 506.

(3) *They should be hung on a frame,* and a square frame is better than a round one, over the bed. Not too high to prevent one from killing any mosquitoes which have gained entrance. By lashing sticks vertically to the four corners of the bed and joining their tops with cord a frame of cord can be made.

(4) *They should not go outside the bedstead.* Neither the headboard nor the foot should be included, but they should come inside of both so as to be tucked under the mattress all around and they should be full enough and long enough to enable one to do this easily.

(5) *They should be thus tucked under the mattress* when one goes to bed and not allowed to trail on the floor. This will allow any mosquitoes which may be under the bed to get at the sleeper. The wind too may blow the loose bar aside and lift it from the floor.

Even when the bar is perfect and perfectly arranged it does not protect when any part of the sleeper's body comes against it—as the mosquitoes can bite through the bar even if they can not come through it. This was especially noticeable with the narrow cots and hospital beds in the Canal Zone. Of course it furnishes no protection until one has gone to bed—although this being the time of greatest risk of malarial infection is the time when protection is most needed.

Good bars well arranged and carefully used furnish much protection and on account of their cheapness should be universally used in malarial countries. They, however, give far less protection than screens. *Under ordinary conditions of malaria as we have them in the United States careful people in a properly screened house are safe.*

ENDEMIC GOITER.

ITS POSSIBLE RELATIONSHIP TO WATER SUPPLY.

By TALIAFERRO CLARK and CLAUDE C. PIERCE, Surgeons, United States Public Health Service.

The use of certain kinds of water for drinking purposes, especially hard water, has long been considered instrumental in the causation of simple thyroid enlargement. In the Milroy Lectures on the Etiology of Endemic Goiter, delivered before the Royal College of Physicians of London, January, 1913, Maj. Robert McCarrison,[1] of the Indian Medical Service, reviewed exhaustively the literature of the affection and set forth his own conclusions relative thereto, based on actual experimentation.

Endemic goiter is present in many parts of the United States, especially in the region of the Great Lakes and in certain sections of West Virginia. A review, therefore, of McCarrison's lectures in connection with epidemiological observations made in the course of a survey of sections of West Virginia is considered of timely interest.

[1] The Lancet, January 18 and 25, and February 8, 1913.